
PART C
USE OF EXPLOSIVE MATERIALS

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WAC 296-52-67010 Blaster in charge responsibilities. The blaster in charge is responsible for all aspects of explosives use and must:

- (1) Carry a current license with the correct blaster classification for the type of blasting being performed.
- (2) Comply with all federal, state, and local government regulations.
- (3) Meet the general license qualifications identified in WAC 296-52-64020, General qualifications.
- (4) Use every reasonable precaution to ensure the safety of the general public and workers. Reasonable precautions include the use of:
 - (a) Blast area surveys.
 - (b) Warning signal posters, which must be posted in suitable locations. Table T-1 shows the information that must be on the poster.

TABLE T-1	
WARNING SIGNAL	A 1 minute series of long blasts 5 minutes prior to blast signal.
BLAST SIGNAL	A series of short blasts 1 minute prior to the shot.
ALL CLEAR SIGNAL	A prolonged blast following the inspection of the blast.

- (c) Flags and barricades.
 - (d) Blasting mats or other suitable protective material.
- (5) Exercise and apply independent professional judgment regarding blasting activities, when following instructions from others could result in an illegal act or affect the outcome of a blast.
- (6) **Blast operation activities.** The blaster in charge must:
 - Have authority over all blasters and be able to promptly correct all actions taken in any area of the blast operation
 - Manage the blast operation properly for any type of blasting being performed
 - Control blast activities associated with a blast
 - Supervise explosive material activities, which include:
 - Keeping a running inventory of all explosives and blasting agents stored at the blast area
 - Supervising all on-site transportation, storage, loading, and firing of explosives
 - Notify local jurisdictions when blasting may affect them
 - Designate safe locations for personnel during the blast
 - Designate a method to determine when all personnel are accounted for in designated safe locations
 - Make sure blast observers are able to communicate with the blaster in charge
 - Make sure all possible exits to the blast site are observed immediately prior to each blast
 - Distribute explosives in the shot
 - Be present when a charge is detonated
 - Personally detonate the charge or give an order to a designated blaster to detonate the charge

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- (7) **Notification - Blast incidents.** The blaster in charge must notify the department within twenty-four hours when:
- (a) A misfire is not cleared
 - (b) Vibration and air blast limits cause injury or property damage
 - (c) Flyrock causes injury or property damage
- (8) **Blast records.** The blaster in charge must:
- (a) Keep an accurate inventory of all explosives and blasting agents stored at the blast operation
 - (b) Keep a blast record with the following information:
 - Name of the company or contractor
 - Exact location of the blast
 - Date and time of detonation
 - Name, signature, and license number of the blaster in charge
 - Type of material blasted
 - Type of explosives used
 - Number of holes, burden, and spacing
 - Diameter and depth of holes
 - Total amount of each type of explosives used
 - Maximum amount of explosives per delay period within eight milliseconds
 - Maximum number of hole per delay period within eight milliseconds
 - Method of firing
 - Type of circuit
 - Direction, distance in feet, and identification of the nearest dwelling, house, public building, school, church, or commercial/institutional building not owned or leased by the blaster in charge conducting the blasting
 - Weather conditions
 - Type and height (or length) of stemming
 - A statement indicating whether blast mats or other flyrock protection were used
 - Type of initiation system used
 - Type of delay periods used
 - Seismograph records and readings, if required or used, must accurately identify the:
 - Name of the person and business analyzing the record
 - Exact location of the seismograph
 - Distance of the seismograph from the blast
 - Sketch of the blast pattern. The sketch must include the:
 - Number of hole
 - Burden
 - Spacing distance delay pattern
 - Sketch of the hole profile if decking was used
 - General comments which include:

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- Unusual conditions/situations during the blast
- The calculated scale distance number
- Misfires

- Complete and sign each blast record
- Retain blast records for a minimum of three years
- Make sure blast records are available for department inspection.

Note: A nonmandatory sample blast record can be found in Appendix B. You may use this format or create your own but all the information in this section must be included.

GENERAL EXPLOSIVES RULES

WAC 296-52-67020 Black powder. Black powder, including black powder manufactured for muzzle loading firearms, cannot be used for blasting.

WAC 296-52-67025 Age of explosives. The oldest explosive of the kind needed for a blast, must be used first.

WAC 296-52-67030 Blast site storage. Explosive materials at blast sites must be attended.

WAC 296-52-67035 Day box storage. A day box used for temporary storage of explosive materials at a job site during working hours at a job site must be:

- (1) Constructed in accordance with WAC 296-52-70065, Explosives day box and WAC 296-52-70070, Detonator day box.
- (2) Fire, weather, and theft resistant.
- (3) Marked with the word "EXPLOSIVES."
- (4) Safely separates detonators from other explosives.
- (5) Attended to at all times against theft.
- (6) On ground which slopes away from the day box for proper drainage.

WAC 296-52-67040 Attendants must be present. An authorized attendant must be:

- (1) Physically present.
- (2) Awake.
- (3) Alert.
- (4) Able to see the explosives at all times.
- (5) Able to reach the explosives quickly, without interference.

WAC 296-52-67045 Handling explosives. Explosives must:

- Be handled by only competent and authorized personnel
- Be delivered and issued only to a purchaser or a purchaser's authorized agent
- Be delivered into authorized magazines, approved temporary storage, or handling areas
- Be carried to the blast site from the main storage magazines by the blaster or blaster's helper in special insulated containers, day boxes, or original U.S. DOT shipping containers
- Never be carried in pockets or clothing, including detonators.

WAC 296-52-67050 Trainee supervision. Trainees and inexperienced personnel must work under the direct supervision of a fully qualified licensed blaster who knows the sites:

- Blasting method
- Safety procedures
- Blasting signals.

WAC 296-52-67055 Storms.

- (1) **Dust storms.** Blasting operations must be completely stopped and all personnel removed from the blast area if a heavy dust storm approaches or is present because it could cause static lightning.
- (2) **Thunderstorms.** Blasting operations must stop and all personnel be removed from the blast area if a thunderstorm approaches or is present.

WAC 296-52-67060 Extraneous electricity and radio frequency (RF) transmitters. Precautions must be taken to prevent unintended electric detonator discharge from extraneous electricity and radio frequency (RF) transmitters. The following are sources of common hazards for extraneous electricity and RF transmissions:

- (1) **Extraneous electricity.** Common hazardous sources of extraneous electricity include:
 - Adjacent power lines
 - Dust storms
 - Lightning storms
- (2) **RF transmission sources.** Common hazardous sources of RF transmissions include:
 - **Mobile transmitters**
 - Citizen band (CB)
 - Side band radio
 - VHF (FM) radio
 - UHF cellular telephones
 - Radar
 - **Fixed location transmitters**
 - Base stations for CB
 - Side band or FM radio communications
 - UHF cellular telephone transmitters and service extension repeater systems
 - AM and FM (commercial) radio broadcast transmitters
 - TV broadcast transmitters and repeater system transmitters

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- Surface scan and radio navigation beacons
- **Low flying aircraft** (in particular military aircraft) create the most common serious RF exposures. These highly unpredictable mobile transmitters are very powerful and transmit on a broad spectrum of frequencies, which include, but are not limited to:
 - Radar
 - Laser
 - All common communications bands

Note: The two most dangerous examples are:

- Low flying automatic terrain following guidance systems
- Airplanes which are equipped to jam all common radar and communications frequencies for a distance of several miles around the airborne transmitters.

(3) **Transportation.** Transportation of explosives must meet these requirements:

- **Public highways.** The Washington utilities and transportation commission (UTC) and Washington state department of transportation (WSDOT) require compliance with ANSI D6.1-1988, Uniform Traffic Control Devices
- **Private roads.** You do not have to comply with ANSI on private roads under department jurisdiction if required warning signs are properly placed when electric detonators are present

(4) **Site survey.** The blaster in charge must conduct or assign a designated appointee to conduct an accurate survey of the entire blast area, to determine:

- The clearance points where roads or right of ways enter and exit the required clearance zone
- If the one thousand-foot clearance zone needs adjusting to maintain the permissible clearance zone at all times, if the blast area moves as the job progresses

(5) **Clearance zones.**

Required clearance zones for:	Number of feet
Construction operations	1000 feet
Demolition operations	1000 feet
General industry operations, not subject to construction Requirements	350 feet

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(6) **RF-transmitter warning signs.**



(a) **RF-transmitter warning-sign specifications.**

Signs must:

- Be a specific size. See the signs above for sign dimensions
- Have a “construction” orange background
- Have black letters and borders
- Use all upper case letters that are at least the size shown above

Note: Larger signs may be required where the highway speed limit is more than fifty-five miles per hour.

(b) **Posting** warning signs must:

- Be adequately placed to warn:
 - All transmitter users against the use of:
- Radio frequency transmitters
- CBs
- Mobile phones
- Two-way radios
- All users of routes into the electric detonator clearance zone
- Be prominently displayed when an electric detonator initiation system is being used during blasting operations and when the electric detonators have been removed from the original U.S. DOT approved shipping container
- Be posted at the beginning of the blast zone minimum clearance point saying:

“TURN OFF CB, MOBILE PHONE, 2-WAY RADIO”

(c) **Blast zone signs.**

- The “BLAST ZONE 1,000 FEET” sign must be posted one thousand feet before the “TURN OFF CB, MOBILE PHONE, 2-WAY RADIO” sign

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- The one thousand foot separation distance limit may be reduced (not less than three hundred feet) in very slow vehicle travel zones (such as off-road construction right of ways, rock pits, or quarries)
 - (d) An “END BLAST ZONE” sign must be posted outside the blasting zone clearance limits.
 - (e) Signs must be covered or removed when blasting operations are not being conducted.
 - (7) **Voltage identification.** Electrical transmission and distribution line voltage must be accurately identified.
 - (8) **System clearance identification.** The required clearance for each system must be accurately identified.
 - (9) **RF transmitters.** Mobile RF transmitters must be deenergized or disconnected when they are less than one hundred feet from electric detonators that are not fully contained in their original U.S. DOT shipping containers.
- Note: Fixed location RF transmitters represent a higher level of hazard to both storage and blasting operations involving electric detonators because the transmitters are more powerful and transmit dangerous levels of RF exposure over much greater distances.*
- (10) **Prevention of radio frequency hazards:**
 - (a) Electric detonators in storage or at blasting operations must meet the appropriate distance table requirements published in the IME Publication Number 20, 1988, “*Safety Guide for the Prevention of Radio Frequency Hazards in the Use of Commercial Electric Detonators (Blasting Caps)*.”
 - (b) If it is necessary to conduct blasting operations inside the required separation distances specified in the IME Pamphlet Number 20, 1988:
 - Storage and use of electric detonators is prohibited on the site
 - Only detonating cord, safety fuse, shock tube, or other approved nonelectric systems can be used.

WAC 296-52-67065 Vibration and damage control.

- (1) Ground vibration - maximum limits.

Either Table 8-A or Table 8-B can be used to determine the maximum limits of ground vibration for any dwelling, public building, school church, commercial site, cofferdams, piers, underwater structures, or institutional building nearby the blasting site. The methods used for monitoring vibration and calculating frequency must be included in the blast plan.

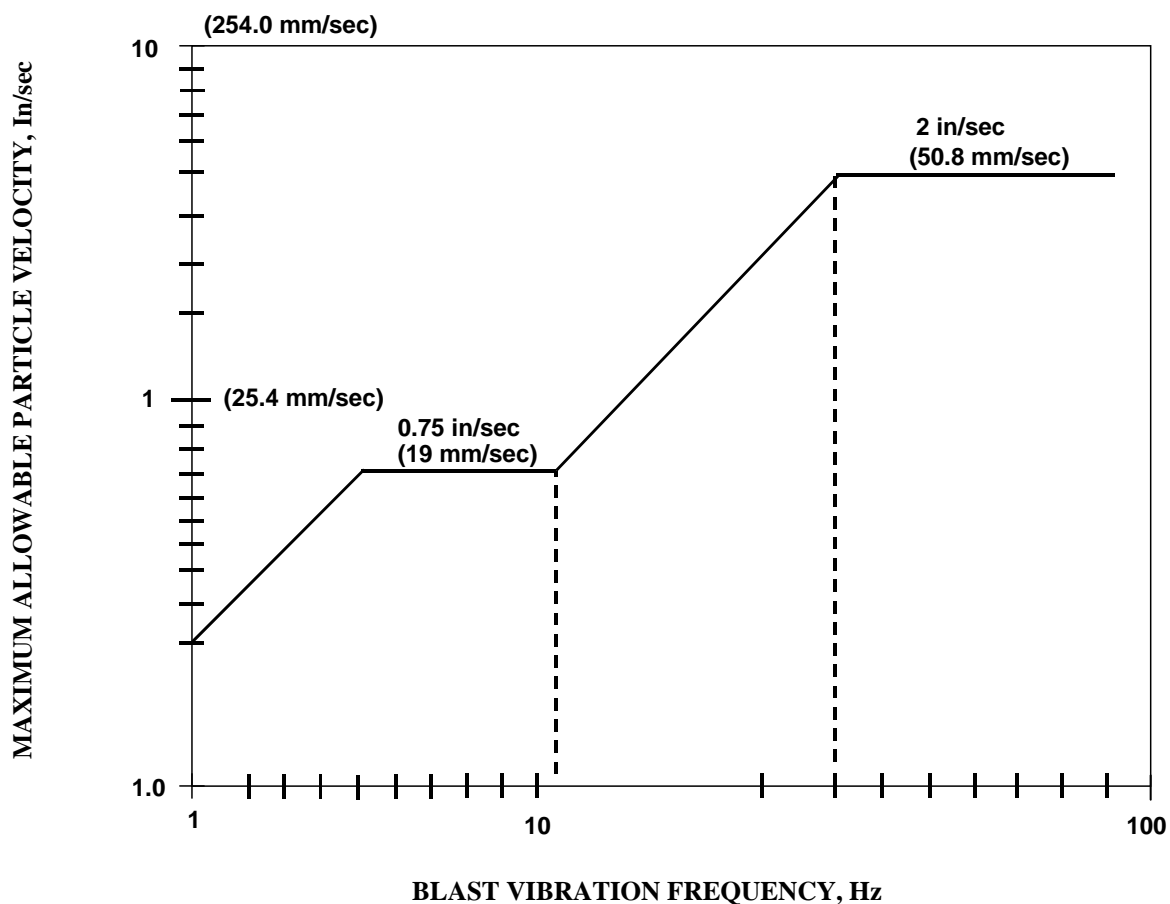
WAC 296-52-67065 (Cont.)

Table 8-A PEAK PARTICLE VELOCITY LIMITS	
Distance from blasting site	Maximum allowable peak particle velocity ¹
0 to 300 ft (91.4 m)	1.25 in/sec (31.75 mm/sec)
301 to 5000 ft (91.5 m to 1524 m)	1.00 in/sec (25.4 mm/sec)
5001 ft (1525 m) and beyond	0.75 in/sec (19 mm/sec)

¹ Peak particle velocity must be measured in three mutually perpendicular directions and the maximum allowable limits must apply to each of these measurements.

- (a) Frequency versus particle velocity graphics. In lieu of Table 8-A, a blasting operation has the option to use the graphs shown in Figure 8a or 8b to limit peak particle velocity based upon the frequency of the blast vibration. If either of the graphs in Figure 8a or 8b is used to limit vibration levels, the methods used for monitoring vibration and calculating frequency must be included in the blast plan.

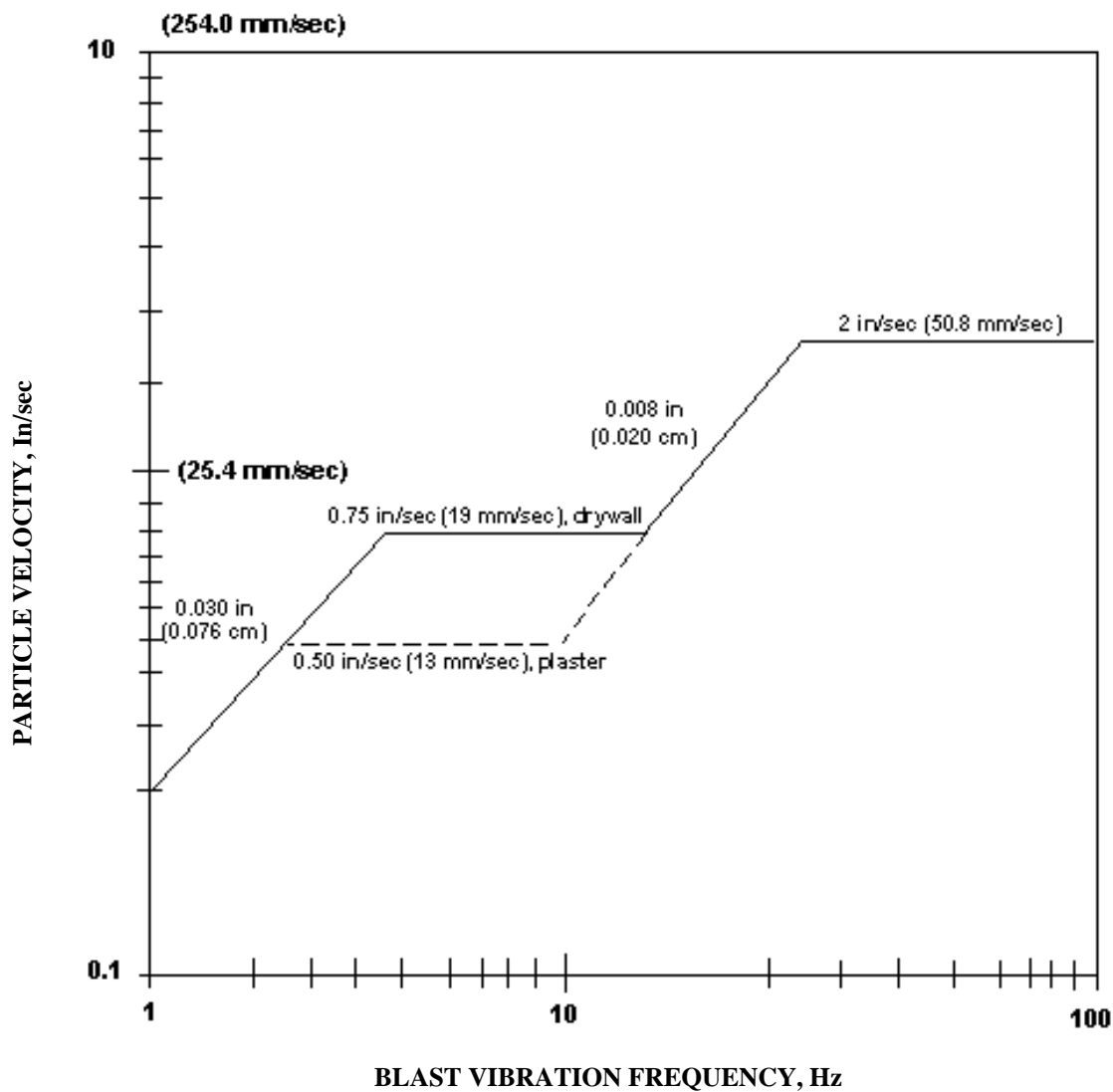
Figure 8a
Alternative Blasting Level Criteria



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Figure 8b

Alternative Blasting Level Criteria



- (b) Scaled distance equations. Unless a blasting operation uses a seismograph to monitor a blast to assure compliance with Table 8-A or Figures 9a or 8b, the operation must comply with the scaled distance equations shown in Table 8-B.

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Table 8-B SCALED-DISTANCE EQUATIONS	
Distance from Blasting Site	Scaled Distance Equation
0 to 300 ft (91.4 m)	$W \text{ (lbs) } := (d \text{ (ft)}/50)^2$ or $W \text{ (kg) } := (d \text{ (m)}/22.6)^2$
301 to 5000 ft (92 m to 1524 m)	$W \text{ (lbs) } := (d \text{ (ft)}/55)^2$ or $W \text{ (kg) } := (d \text{ (m)}/24.9)^2$
5001 ft (1524 m) and beyond	$W \text{ (lbs) } := (d \text{ (ft)}/65)$ or $W \text{ (kg) } := (d \text{ (m)}/29.4)^2$

Key:

W := The maximum weight of explosives in pounds (or kilograms) that can be detonated per delay interval of 8 milliseconds or greater.

d := The distance in feet (or meters) from the blast to the nearest dwelling, public building, school, church, commercial, or institutional building not owned, leased, or contracted by the blasting operation, or on property where the owner has not given a written waiver to the blasting operation.

Note: To convert English Units of scaled distances (ft/lb²) to metric units (m/kg²) divide by a factor of 2.21.

- (2) **Air blast - Maximum limits.** Air blast must not exceed the maximum limits listed in Table 8-C. Use Table 8-C to determine maximum air blast limits at any dwelling, public building, school, church, commercial, or institutional building not owned, leased, contracted, or on the property where the owner has not provided a written waiver to the blasting operation.

	Table 8-C AIR-BLAST LIMITS		
	Lower Frequency of Measuring System in Hz (.+ or - 3 decibels)	Measurement Level in Decibels	
	0.1 Hz or Lower	Flat Response	134 Peak
	2 Hz or Lower	Flat Response	133 Peak
	6 Hz or Lower	Flat Response	129 Peak
	C-Weighted	Slow Response	105 Peak dBC

- (3) Flyrock outside the blast area:
- (a) **Uncontrolled flyrock.** Flyrock traveling in the air or along the ground cannot be cast from the blast area in an uncontrolled manner, which could result in personal injury or property damage. Uncontrolled flyrock (airborne or along the ground), that could cause personal injury or property damage, is not allowed from the blast area.
 - (b) **Contract or written waiver.** Flyrock cannot be propelled from the blast area onto property where the blasting operation has not contracted or received a written waiver from the owner.
 - (c) **Use of protective material.** When blasting in congested areas or close to a structure, railway, highway, or any other installation that could be damaged, the blast must be covered, before firing, with a mat or other protective material that will prevent fragments from being thrown.

WAC 296-52-67070 Storage at blast sites.

- (1) **Packaging materials.** Empty boxes, paper, and fiber packing materials that have previously contained explosive materials must be:
 - Disposed of in a safe manner
 - OR**
 - Reused in accordance with U.S. DOT hazardous materials regulations
- (2) **Opening fiberboard cases.** Nonsparking metallic slitters may be used for opening fiberboard cases.
- (3) **Deteriorating explosives.** Deteriorating explosives must be carefully set aside and disposed of according to the manufacturer's specifications.

WAC 296-52-67075 Blast area precautions.

- (1) **Warning signs.** Blast area warning signs must:
 - (a) Be set up at all entrances to the blast area.
 - (b) Have lettering a minimum of four inches high and on a contrasting background.
- (2) **Loaded stumps.** All loaded stumps must be marked for identification.
- (3) **Lock out.** Cables close to the blast area must be deenergized and locked out by the blaster in charge.

WAC 296-52-67080 Drilling.

- (1) **Unexploded charges.**
 - (a) Drilling cannot begin:
 - (i) When there is danger of drilling into a charged or misfired hole.
 - (ii) Until all remaining butts of old holes are examined for unexploded charges.
 - (b) Unexploded charges must be refired before work proceeds.
- (2) **Distance limits during drilling.** Blasters cannot load or use explosives closer than:
 - (a) The length of the steel being used for drilling
 - OR**
 - (b) Within 50 feet of drilling operations, whichever is greater.
- (3) **Prior to loading drill holes.**
 - (a) Holes must be checked prior to loading to determine depth and conditions.
 - (b) Drill holes that have contained explosives or blasting agents cannot be deepened.
 - (c) Drill holes must be large enough to allow unobstructed or free insertion of explosive cartridges.

WAC 296-52-67080 (Cont.)

(4) **Enlarging or springing a drill hole.**

- (a) A drill hole cannot be sprung when it is near a loaded hole.
- (b) A minimum of two hours must pass after a charge has exploded in a drill hole that was enlarged or “sprung,” before loading another charge of explosives into the hole.

Note: You do not have to wait two hours if the sprung hole is thoroughly wet down with water before it is loaded.

- (c) Flashlight batteries cannot be used as a power source for springing holes.

WAC 296-52-67085 Loading blast holes.

- (1) **Power lines and portable electric cables.** Power lines and portable electric cables must be kept at a safe distance from explosives or blasting agents being loaded into drill holes.

(2) **Equipment, machinery, and tools.**

- Any machine or tool not being used to load holes must be removed from the immediate loading area
- Equipment cannot be operated within fifty feet of loaded holes except when:
 - It is needed to add burden or mats
 - Tracking drills out of the loading area

- (3) **Holes that may be loaded.** Only holes that will be fired in the next blasting round may be loaded.

(4) **Tamping.**

- (a) A primer must never be tamped.
- (b) Tamping must be done with wood rods or approved plastic tamping poles that do not have exposed metal parts.
- (c) Nonsparking metal connectors may be used for jointed poles.
- (d) Violent tamping must be avoided.

- (5) **Pneumatic loading.** When loading blasting agents pneumatically over primed boosters:

- A semiconductive delivery hose must be used
- Equipment must be bonded and grounded

- (6) **Stemming.** All blast holes in open work must be stemmed to:

- (a) The collar.

OR

- (b) A point, which will confine the charge.

WAC 296-52-67085 (Cont.)

- (7) **Attendance of holes.** Loaded holes must be attended or protected.
- (8) **Unused explosives.** After loading, all remaining explosives and detonators must be immediately returned to an authorized magazine or day box.

WAC 296-52-67090 Initiation systems.

- (1) **General initiation rules.**
 - (a) **Training and supervision.**
 - (i) The blaster in charge must provide adequate on-the-job training and supervision in the safe use of initiation systems.
 - (ii) All members of the blasting crew must be instructed, by the blaster in charge, in the safe use of the initiation system to be used and its system components.
 - (b) **Manufacturer recommendations.** All initiation systems and system components must be used in accordance with manufacturer recommendations and instructions.
 - (c) **Vehicle use precautions.**
 - (i) Explosives bulk trucks or other vehicles operated on a blast site cannot tread on:
 - (A) Tubing
 - (B) Connectors
 - OR**
 - (C) Any surface delay component
 - (ii) If a vehicle must pass over loaded blast holes. Precautions must be made to consolidate tubing, connectors, or any surface delay component at the collar of the hole to prevent vehicle contact.
 - (d) **Connecting the firing line.** Firing lines cannot be connected to the blast initiating device until all personnel are:
 - (i) Accounted for
 - (ii) Removed from the blast danger area
 - OR**
 - (iii) Are in a blast shelter or other location that provides equivalent protection
- (e) **Visual inspection.** The blaster in charge must visually inspect the initiation system to make sure it is assembled according to the manufacturer's recommendations, before firing the shot.

WAC 296-52-67090 (Cont.)

(f) **Explosives not used:**

- (i) Unused detonators or short capped fuses cannot be placed in holes that may be used for blasting.
- (ii) Unused detonators must be removed from the work area and disposed of or stored in a licensed magazine.
- (iii) Loose cartridges of explosives, detonators, primers, and capped fuses that are not used by the end of the work shift must be returned to and locked in their magazines.

(2) **Nonelectric initiation systems.**

(a) **Shock tube lines.** When a nonelectric shock tube initiation system is used:

- (i) Spools of shock tube lines cannot be spooled from trucks or equipment.
- (ii) The shock tube line must:
 - (A) Be free of knots and tight kinks
 - (B) Be free of cuts or abrasions that could expose the core to moisture
 - (C) Not be stretched
 - (D) Be neat and orderly
- (iii) Tie ins must be kept neat and clean.
- (iv) Unused lead line must be sealed to prevent moisture and dirt from entering the tube.
- (v) Care must be taken to avoid hitting the tube with a shovel when the shock tube is being covered.
- (vi) The end of the detonator must be pointed toward the front of the shot to minimize the chance of shrapnel flying to the rear of the blast where the shock tube will be lit.

(b) **Surface connector blocks.** Nonelectrical tubes must:

- (i) Be secured properly in surface connector blocks.
- (ii) Never exceed the rated capacity of tubes in surface connector blocks.

(c) **Splicing line.** A knot must be tied in the tubes to take the strain off of the splice.

(d) **Detonator cord.** If a detonator cord is used for surface tie in:

- (i) All lines must be kept taut.
- (ii) Connections to nonelectrical units must be at ninety degree angles.

WAC 296-52-67090 (Cont.)

(e) **Equipment and personnel.**

- (i) Equipment cannot roll over shock tubes.
- (ii) All unnecessary equipment and personnel must be removed from the blast area during loading.

(3) **Electric initiating systems.**

(a) **Survey of extraneous currents.** A survey to evaluate extraneous currents must be conducted:

- (i) By the blaster in charge before adopting any system of electrical firing.
- (ii) To eliminate all currents before holes are loaded.

(b) **Detonator compatibility, style, function, and manufacture.** In any single blast using electric detonators, all detonators must be:

- (i) Compatible with each other.
- (ii) Of the same style or function.
- (iii) From the same manufacturer.

(c) **Wire capacity and gauge.**

- (i) Connecting wires and lead wires must:
 - (A) Be insulated single solid wires with sufficient current carrying capacity
 - (B) Not be less than twenty gauge (American wire gauge) solid core insulated wire
- (ii) Firing line or lead wires must:
 - (A) Be made of solid single wires with sufficient current carrying capacity
 - (B) Not be less than fourteen gauge (American wire gauge) solid core insulated wire

Note: Bus wires, depends on the size of the blast, fourteen gauge (American wire gauge) copper is recommended.

(d) **Lead wires.**

- (i) **Shunting.** You must shunt the ends of lead wires that will be connected to a firing device by twisting them together before they are connected to leg or connecting wires.
- (ii) **Control.** The blaster in charge must keep control of shunted lead wires until loading is completed and the leg wires are attached.
- (iii) **Attachment.** Lead wires must be attached by the blaster in charge when it is time to fire the shot.

WAC 296-52-67090 (Cont.)

- (e) **Detonator leg wires.** Electric detonator leg wires must:
 - (i) Be kept shunted (short circuited) until they are connected into the circuit for firing.
 - (ii) Not be separated (except for testing) until all holes are loaded and the loader is ready to connect the leg wires to the connecting or lead wires.
- (f) **Circuits.**
 - (i) Blasting circuits or power circuits must be used in electric blasting and according to the electric detonator manufacturer's recommendations.
 - (ii) Care must be taken to make sure an adequate quantity of delivered current is available according to the manufacturer's recommendations, when firing a circuit of electric detonators.
 - (iii) A power circuit used for firing electric detonators cannot be grounded.
 - (iv) The firing switch must be designed so the firing lines to the detonator circuit automatically short circuit when the switch is in the "off" position.
 - (v) The firing switch must be locked in the "open" or "off" position at all times, except when firing from a power circuit.
- (g) **Firing line insulation.** The insulation on all firing lines must be adequate and in good condition when firing electrically.
- (h) **Testing.**
 - (i) The firing line must be checked at the terminals with an approved testing device before being connected to the blasting machine or other power sources.
 - (ii) The circuit, including all detonators, must be tested with an approved testing device before being connected to the firing line.
- (i) **Switch keys.** The blaster in charge is the only person who is allowed to have firing switch keys in their possession.
- (j) **Blasting machines.** A nonelectric system must be used if these requirements cannot be satisfied:
 - (i) Blasting machines must be in good condition.
 - (ii) The efficiency of the blasting machine must be tested periodically to make sure it delivers power at its rated capacity.
 - (iii) **Responsible person.**
 - The blaster in charge must be in charge of blasting machines
 - The blaster in charge must connect the lead wires to the blasting machine and must fire the shot.

WAC 296-52-67090 (Cont.)

(iv) **Connections.**

- When firing with blasting machines, connections must be made according to the manufacturer of the electric detonator's recommendations
- All connections must be made from the drill hole back to the source of the firing current
- Lead wires must remain shunted and not connected to the blasting machine or other source of current until the charge is ready to fire
- The number of electric detonators connected to a blasting machine cannot exceed the blasting machine's rated capacity.

(v) **Series circuit.** In primary blasting, a series circuit cannot contain more detonators than the manufacturer's recommended limits for electric detonators.

(vi) **Circuit testing.** A blaster in charge must use blasting testers specifically designed to test circuits to charged holes.

(vii) **Blasting near power lines.** Whenever lead or blasting wires could be thrown over live overhead powerlines, communication lines, utility services, or other services or structures by the force of an explosion, care must be taken to make sure:

- (A) The total length of wires are short enough so they will not hit the lines
- (B) The wires are securely anchored to the ground
- (C) The owners or operators of the utilities blasting in the area are notified

(viii) **Disconnecting lead wires.** After firing an electric blast from a blasting machine, lead wires must be immediately disconnected from the machine and short-circuited.

WAC 296-52-67095 Use of safety fuse with detonators.

(1) **Restricted or prohibited use.**

(a) Safety fuse and detonators, used for conventional blasting, must be in the following:

- (i) When extraneous electricity or radio frequency transmissions make the use of electric detonators and wire systems dangerous.
- (ii) When overhead electric transmission lines cannot be deenergized and there is danger that blasting wires may be thrown onto the overhead lines during a blast.
- (iii) For avalanche control hand charges.
- (iv) For specialized applications when detonators and fuses are more suitable than electric or other nonelectric initiation systems.

(b) **Mudcap charges.** A detonator and fuse cannot be used for firing mudcap charges, unless the charges are separated to prevent one charge from dislodging other charges in the blast.

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- (c) **Drop fuse method.** Dropping or pushing a primer or any explosive with a lighted fuse attached is prohibited.
- (d) **Damaged fuses.**
 - (i) Deteriorated or damaged fuses cannot be used.
 - (ii) It is prohibited to hang fuses on nails or other objects, which causes sharp bends in the fuse.
- (2) **Fuse length.** Fuses:
 - (a) Must be cut long enough to reach beyond the collar of the drill hole.
 - (b) Must be three feet or longer.
- (3) **Fuse burning rate.**
 - (a) Safety fuse burning rates must be:
 - (i) Measured.
 - (ii) Posted in conspicuous locations.
 - (iii) Brought to the attention of all workers.
 - (b) A fuse must burn between forty and fifty-five seconds per foot or it cannot be used.
- (4) **Blaster safety.** When blasting with safety fuses, the length and burning rate of the fuse must allow sufficient time for the blaster to reach a place of safety.
- (5) **Fuse capping.**
 - (a) **Capping location.** Fuses:
 - (i) Must not be capped in any magazine or near any possible source of ignition.
 - (ii) Must be capped in a place designated for this purpose.
 - (iii) Must be capped at least one hundred feet from any storage magazine.
 - (b) **Fuse ends.** Before capping a safety fuse, a short length must be cut from the end of the supply reel to guarantee a freshly cut end in each detonator.
- (6) **Crimpers.**
 - (a) **Design.** The design of detonator crimpers used for attaching detonators to safety fuses must be approved.
 - (b) **Condition.** Crimpers must be in good repair.

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- (c) **Accessibility.** Crimpers must be accessible for use.
- (7) **Waterproofing.** The joint between the detonator and fuse must be waterproofed with a compound for use in wet locations.
- (8) **Primers.**
 - (a) **Site selection.** Primers must:
 - (i) Not be made in magazines or near possible sources of ignition.
 - (ii) Be made in a place designated for this purpose.
 - (iii) Be made a minimum of one hundred feet from any storage magazine.
 - (b) **Making primers.** When making primers:
 - (i) Make only enough for one day's use.
 - (ii) Only nonsparking skewers must be used for punching the hole in the cartridge to insert the capped fuse.
 - (iii) A detonator cannot be inserted in explosives without first making a hole in the cartridge of proper size or using a standard detonator crimper.
 - (c) **Storage.** Primers must:
 - (i) Be stored in a box type magazine.
 - (ii) Not be stored in magazines where other explosives are stored.
- (9) **Hand lighting.**
 - (a) No one may light more than twelve fuses at a time when hand lighting devices are used.
 - (b) Two fuses may be considered one fuse when two or more grouped safety fuses are lit as a single fuse by:
 - (i) An igniter cord
 - OR**
 - (ii) Other similar fuse lighting devices.
 - (c) When multiple detonators and blasting is done by hand lighting methods, at least two people must be present.

WAC 296-52-67100 Use of detonating cord.

- (1) **Cord selection.** Care must be taken to select a detonating cord consistent with the:
 - Type and physical condition of the drill hole
 - Stemming

WAC 296-52-67100 (Cont.)

- Type of explosives used
- (2) **Handling.** A detonating cord must be handled and used with:
- The same respect and care given to other explosives
 - Care to avoid damaging or severing the cord during and after loading and hooking up
- (3) **Calculating quantity and distance.**
- For quantity and distance purposes, a detonating fuse (up to sixty grains per foot) should be calculated as equivalent to nine pounds of high explosives per one thousand feet
 - Heavier cord loads should be rated proportionally
- (4) **Trunk lines.**
- Detonators for firing the trunk line cannot be brought to the loading area or attached to the detonating cord until everything else is ready for the blast
 - All detonating cord trunk lines and branch lines must be free of loops, sharp kinks, or angles that direct the cord back toward the oncoming line of detonation
 - Truck lines in multiple row blasts must make one or more complete loops, with cross ties between loops at intervals less than two hundred feet.
- (5) **Connections.**
- (a) **Detonating cord.** All detonating cords must be:
- (i) Competent and positive in accordance with the manufacturer's recommended specifications.
 - (ii) Kept at right angles to the trunk lines.
 - (iii) Inspected before firing the blast.
- (b) **Knots.**
- (i) Knot or other cord-to-cord connections must be made with a detonating cord where the explosive core is dry.
 - (ii) All detonator cord knots must be tight.
- (c) **Connecting detonators.**
- (i) A detonator or electric detonator must be taped or securely attached along the side or end of the detonating cord. The detonator end containing the explosive charge must be pointed in the direction of the detonation.
 - (ii) Manufacturer's recommendations must be followed when short interval delay electric detonators are used with a detonating cord.

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- (iii) Manufacturer's recommendations must be followed when detonating cord millisecond delay connectors are used with a detonating cord.
- (iv) The line of detonating cord extending from a drill hole or a charge must be cut from the supply spool before loading the remainder of the drill hole or placing additional charges.

WAC 296-52-67105 Firing the blast.

- (1) A code of blasting signals, equivalent to Table T-1, must be posted in one or more conspicuous places at the blast area and all employees must familiarize themselves with the code of blasting signals and use it. Warning signs must be placed at suitable locations, see WAC 296-52-67075(1), Warning signs.
- (2) All charges must be covered with blasting mats or other protective material before firing, where blasting may cause injury or damage by flying rock or debris.
- (3) Before a blast is fired, the blaster in charge must give a loud warning signal after they have verified all surplus explosives are in a safe place and all employees, vehicles, and equipment are at a safe distance or under sufficient cover.
- (4) Flaggers must be safely stationed on highways that pass through the danger zone, to stop traffic during blasting operations on highways that pass.
- (5) The blaster in charge must set the time of the blast and conduct all blasting operations so no shots will be fired without their approval.

TABLE T-1	
WARNING SIGNAL	A 1 minute series of long blasts 5 minutes prior to blast signal.
BLAST SIGNAL	A series of short blasts 1 minute prior to the shot.
ALL CLEAR SIGNAL	A prolonged blast following the inspection of the blast.

WAC 296-52-67110 Precautions after firing.

- (1) **Immediately after firing.** Immediately after firing, the blaster in charge must:
 - (a) Disconnect the firing line from the blasting machine.
 - (b) Lock the power switches in the “open” or “off” position.
 - (c) Carefully trace all wires and search for unexploded charges.
- (2) **Post blast inspection.** The blaster in charge must perform an inspection of the area and surrounding rubble to determine if all charges have been exploded before employees are allowed to return to the operation.
- (3) **Misfires.**
 - (a) **Misfire found.** Misfires must be:
 - (i) Immediately reported to their supervisor.

WAC 296-52-67110 (Cont.)

- (ii) Recorded on the blast record.
 - (iii) Reported to the department within twenty-four hours if not cleared.
- (b) **Responsible person.** A blaster in charge must be present and direct the handling of all misfires.
- (c) **Termination of work.**
 - (i) All work must stop, except activities needed to remove the misfire hazard.
 - (ii) Drilling, digging, or picking is not permitted until:
 - (A) All misfired holes have been detonated
 - OR**
 - (B) The blaster in charge determines work can proceed
- (d) **Evacuation precautions.** The following evacuation precautions must be taken in the event of a misfire:
 - (i) If a misfire is found, the blaster in charge must make sure safeguards are in place to keep all employees or other personnel from the danger zone, except those needed to remove the misfire hazard.
 - (ii) Workers cannot return to misfired holes for at least:
 - (A) Thirty minutes when electric blasting caps are used
 - (B) One hour when detonators and fuses are used
- (e) **Charged or misfired holes.**
 - (i) Attempts cannot be made to remove explosives from any charged or misfired hole.
 - (ii) A new primer must be connected and the hole refired.
- (f) **Refiring hazard.** If refiring a misfired hole presents a hazard, explosives may be:
 - (i) Removed by washing out the explosives with water
 - OR**
 - (ii) Removed with air, if the misfire is under water.
- (4) **Burning holes.**
 - (a) Everyone in the endangered area must move to a safe location when explosives are suspected of burning in a hole.

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- (b) No one, under any circumstances, may return to the hole:
 - (i) Until the danger has passed
- OR**
- (ii) For at least one hour after the hole has been found.

WAC 296-52-67115 Excavation work in pressurized air locks.

- (1) **Receiving, handling, storing, and transportation.**
 - (a) The blaster in charge or powder person is responsible for the receipt, unloading, storage, and on-site transportation of explosives and detonators.
 - (b) Explosives in transit cannot be left unattended.
 - (c) Detonators and explosives for each round must be taken directly from the magazines to the blasting zone and immediately loaded.
- (2) **Wet holes.** Explosives appropriate for use in wet holes must be:
 - (a) Water resistant
- AND**
- (b) Fume Class 1 or other approved explosives.
- (3) **Bonding.** All metal pipes, rails, air locks, and steel tunnel linings must be:
 - (a) Electrically bonded together and grounded at or near the portal or shaft.
 - (b) Cross bonded together at not less than one thousand-foot intervals throughout the length of the tunnel.
- (4) **Air locks.**
 - (a) No one is allowed to enter the air lock when detonators or explosives are brought in, except:
 - (i) The blaster in charge.
 - (ii) The powder person.
 - (iii) The lock tender.
 - (iv) Employees needed to carry explosive materials.
 - (b) Primers, detonators, and explosives must be taken separately into pressure working locks.
 - (c) Material, supplies, or equipment cannot be brought into air locks with explosive materials.

WAC 296-52-67115 (Cont.)

- (d) Detonators and explosives not used after loading a round must be removed from the working chamber before connecting the connecting wires.
- (5) **Grounding.** Each air supply pipe must be grounded at its delivery end.
- (6) **Mixed face.**
 - (a) Light charges and light burdens must be used for each hole when tunnel excavation in rock face is approaching or is in mixed face.
 - (b) Advance drilling must be done when tunnel excavation in rock face approaches mixed face to determine the:
 - (i) General nature and extent of rock cover
 - AND
 - (ii) Distance to soft ground as excavation advances.

BLASTING AGENTS

WAC 296-52-67125 Transportation, storage, and use. Unless otherwise specified in this part, blasting agents must be transported, stored, and used in the same manner as explosives.

Note: Water-gels are covered in WAC 296-52-67150, Water-gel and emulsion explosives and blasting agents, through WAC 296-52-67170, Bulk delivery/mixing vehicles.

WAC 296-52-67130 Fixed location mixing.

- (1) **Building location.** Buildings or other facilities used for manufacturing blasting agents must meet the separation distance requirements of Table H-21 for inhabited buildings, passenger railroads, and public highways.
- (2) **Building construction.** Buildings used for mixing blasting agents must be constructed of noncombustible material or sheet metal on wood studs and be well ventilated.
- (3) **Determining distance.** When determining the distances separating highways, railroads, and inhabited buildings from potential explosions (Table H-20), the sum of all masses that may propagate (i.e., lie at distances less than specified in Table H-22) from either individual or combined donor masses are included in the sum. However, when the ammonium nitrate is included, only fifty percent of its weight must be used because of its reduced blast effects.
- (4) **Heat sources.**
 - (a) **Internal heating units.** Properly designed and located heating units that do not depend on combustion processes may be used in the building.
 - (b) **External heating units.** All direct sources of heat must be located outside the mixing building.
- (5) **Mixing plant floors** must be made of nonabsorbent materials such as concrete.

WAC 296-52-67130 (Cont.)

(6) Electrical equipment.

- (a) Electrical switches, controls, motors, and lights located in the mixing room must:
 - (i) Comply with the requirements of WAC 296-800-280.
 - (ii) Be located outside the mixing room.
- (b) The frame of the mixer and all other equipment must be:
 - (i) Electrically bonded.
 - (ii) Provided with a continuous path to ground.

(7) Internal combustion engines.

- (a) **Location.** All internal combustion engines used for electric power generation must be:
 - (i) Located outside the mixing plant building.

OR

 - (ii) Properly ventilated and isolated by a firewall.
- (b) **Exhaust systems.** Engine exhaust systems must be positioned so spark emission does not become a hazard to any material in or adjacent to the plant.

(8) Mixing equipment. Equipment used for mixing blasting agents must comply with the following:

- (a) **Design.** The design of the mixer must:
 - Minimize the possibility of frictional heating, compaction, and confinement
 - Have the bearings and drive assemblies mounted outside the mixer and protected against the accumulation of dust
 - Have the surfaces accessible for cleaning
- (b) **Construction.** Mixing and packaging equipment must be constructed of materials compatible with the fuel ammonium nitrate composition.
- (c) **Fire precautions.** The following fire precautions must be followed:
 - (i) **Mixer fuel oil flow.** In case of fire:
 - (A) Appropriate means to prevent the flow of fuel oil to the mixer must be provided
 - (B) An automatic spring-loaded shutoff valve with fusible link must be installed in gravity flow systems

WAC 296-52-67130 (Cont.)

- (ii) **Flame/spark producing devices.** Smoking, matches, open flames, spark-producing devices, and firearms (except firearms carried by law enforcement bomb squad members or qualified guards), are not allowed inside or within fifty feet of any facility used for mixing blasting agents.
- (9) **Blasting agent compositions.** The following are requirements for determining blasting agent compositions:
 - (a) **Determining sensitivity.** The sensitivity of the blasting agent must be determined by means of a Number 8 test detonator at regular intervals and after every change in formulation.
 - (b) **Handling precautions.** Precautions must be taken when handling:
 - Small particle oxidizers, such as crushed ammonium nitrate prills or fines, may be more sensitive than coarser products and must be handled with greater care
 - Solid fuels must be used in a manner to minimize dust explosion hazards
 - Metal powders, such as aluminum, must be:
 - Kept dry
 - OR**
 - Stored in moisture resistant or weather tight containers or bins
 - (c) **Use restrictions.** The following cannot be used:
 - (i) Crude and crankcase oil
 - (ii) Hydrocarbon liquid fuel with a flash point lower than the 125°F minimum for Number 2 diesel fuel oil
 - OR**
 - (iii) Peroxides and chlorates.
- (10) **Fuel oil storage.**
 - (a) **Facilities.** Fuel oil storage facilities must be:
 - (i) Independent structures
 - OR**
 - (ii) Located at a site away from the manufacturing building.
 - (b) **Surrounding area.** In order to prevent oil from draining toward a manufacturing building in the event of a tank rupture, the surrounding grounds must slope away from the building.
- (11) **Safety precautions.** Safety precautions at mixing plants must include these requirements:
 - (a) **Floor construction.** Floors must be constructed to eliminate floor drains and piping where molten materials could flow and be confined, in case of fire.

WAC 296-52-67130 (Cont.)

- (b) **Mixing/packaging room.** The floors and equipment of the mixing and packaging room must be cleaned regularly and thoroughly to prevent accumulation of oxidizers, fuels, and other sanitizers.
- (c) **Housekeeping.** The following housekeeping requirements must be followed:
 - (i) **Mixing plant.** The mixing and packaging plant must:
 - (A) Be cleaned regularly and thoroughly to prevent excessive accumulation of dust
 - (B) Safely dispose of empty ammonium nitrate bags daily
 - (ii) **Surrounding area.** The land surrounding the mixing plant must be kept clear of brush, dried grass, leaves, and other materials for a minimum of twenty-five feet.
- (d) **Welding.**
 - (i) Welding or open flames are not permitted in or around the mixing or storage area of the plant unless:
 - (A) The equipment or area has been completely washed
 - AND**
 - (B) All oxidizer material has been removed
 - (ii) Before welding or repairing hollow shafts:
 - (A) Oxidizer materials must be removed from the inside and outside of the shaft
 - AND**
 - (B) The shaft must be vented with a minimum 1/2-inch diameter opening
- (e) **Explosives.** Explosives are not permitted inside or within fifty feet of any facility used for mixing blasting agents.

WAC 296-52-67135 Bulk delivery/mixing vehicles.

Note: This section applies to both off highway operations and public highway transportation.

- (1) **Vehicles.** These vehicle requirements must be followed:
 - (a) **Strength.** A bulk delivery vehicle must be strong enough to carry a load without difficulty.
 - (b) **Mechanical condition.** A bulk delivery vehicle must be in good mechanical condition.
 - (c) **Body.** A bulk vehicle body for delivering and mixing blasting agents must:
 - (i) Be constructed of noncombustible materials.
 - (ii) Have closed bodies if they are used to transport bulk premixed blasting agents.

WAC 296-52-67135 (Cont.)

- (d) **Mixing system parts.**
 - (i) All moving parts of the mixing system must be designed to prevent heat buildup.
 - (ii) Shafts or axles which contact the product must have outboard bearings with a minimum of one-inch clearance between the bearings and the outside of the product container. Special attention must be given to the clearances on all moving parts.
- (e) **Welding.**
 - (i) Welding or open flames are not permitted in or around the mixing or storage area of the plant unless the equipment or area has been completely washed and all oxidizer material removed.
 - (ii) Before welding or repairing hollow shafts:
 - (A) All oxidizer material must be removed from the inside and outside of the shaft
 - AND**
 - (B) The shaft must be vented with a minimum 1/2-inch diameter opening
- (2) **Vehicle operation.** Operation of bulk delivery and mixing vehicles must comply with WAC 296-52-680, Transportation of explosive material, U.S. DOT placard requirements, and these requirements:
 - (a) **Driver training.** The vehicle driver must be:
 - (i) Trained in the safe operation of the vehicle, mixing, conveying, and related equipment.
 - (ii) Familiar with the load being delivered and general procedures for handling emergencies.
 - (b) **Cargo and containers.** Cargo and containers must:
 - (i) Haul either detonators or other explosives, but not both, it is permitted on bulk trucks provided a special wood or nonferrous-lined container is installed for explosives.
 - (ii) Be U.S. DOT specified shipping containers, according to 49 CFR Chapter 1.
 - (c) **Moving a vehicle in the blast area.** When moving a vehicle in the blast area:
 - (i) The driver must exercise caution to avoid driving the vehicle onto or dragging hoses over firing lines, cap wires, or explosive materials
 - AND**
 - (ii) A second person must help guide the vehicle driver's movements.
- (3) **Pneumatic loading.** Pneumatic loading from bulk delivery vehicles into blast holes primed with electric detonators or other static sensitive systems must comply with these requirements:
 - (a) A positive grounding device must be used to prevent accumulation of static electricity.

WAC 296-52-67135 (Cont.)

- (b) A discharge hose must:
 - (i) Have a resistance range that will prevent conducting stray currents
 - OR**
 - (ii) Be conductive, to bleed off static buildup.
 - (c) A qualified person must evaluate all static sensitive systems to determine if they will adequately dissipate static under potential field conditions.
- (4) **Repairs.** Bulk delivery vehicle repair must comply with the requirements of this section.
- (5) **Prohibited activities.** The following are prohibited:
- (a) In-transit mixing of materials.
 - (b) While in or about bulk vehicles in the process of the mixing, transferring or down-the-hole loading of water-gels at or near the blasting site:
 - (i) Smoking
 - AND**
 - (ii) Carrying flame producing devices including matches and firearms near bulk vehicles in the process of mixing, transferring, or down-the-hole loading of water-gels, at or near the blast site.

WAC 296-52-67140 Bulk storage bins.

- (1) **Construction.** A bin, including supports, must be:
- (a) Waterproof.
 - (b) Constructed of compatible materials.
 - (c) Adequately supported and braced to withstand the combined force of all loads, including impact from product movement within the bin and accidental vehicle contact with the support legs.
- (2) **Discharge gates.** A bin discharge gate must be designed to lock and close tightly to prevent leakage of the stored product and to lock.
- (3) **Loading manways.** Bin loading manways or access hatches must be hinged or attached to the bin and designed to lock.
- (4) **Electric conveyors.** An electrically driven conveyor used for loading or unloading bins must:
- (a) Comply with the requirements of WAC 296-800-280, Basic electrical rules.
 - (b) Be designed to minimize corrosion damage.

WAC 296-52-67140 (Cont.)

- (5) **Separation distances.** The following separation distances must be followed:
- (a) **Blasting agent bins.** Bins containing blasting agents must meet the distance requirements of:
 - (i) Table H-20, in reference to separation from inhabited buildings, passenger railroads, and public highways
 - OR**
 - (ii) Table H-22, in reference to separation from other explosives and blasting agent storage facilities.
 - (b) **Ammonium nitrate bins.** Bins containing ammonium nitrate must meet the distance requirements of Table H-22 in reference to separation of blasting agent and explosives storage.

WAC 296-52-67145 Transportation of blasting agents.

- (1) **Public highways.** The following must comply with the United States Department of Transportation's (U.S. DOT) requirements:
 - (a) Packaging, marking, and labeling containers of blasting agents that are being transported on public highways.
 - (b) Vehicles must follow placard regulations for transporting blasting agents on public highways.
- (2) **Transporting blasting agents and explosives together.** Transportation of blasting agents with explosives in the same vehicle must meet the requirements of WAC 296-52-68060, Operation of vehicles transporting explosives.
- (3) **Vehicles.** Vehicles transporting blasting agents must be in safe operating condition at all times.
- (4) **Prohibited activities.** The following activities are prohibited:
 - (a) Carrying matches, firearms, acids, or other corrosive liquids, in the bed or body of any vehicle containing blasting agents.
 - (b) Allowing anyone who is smoking or under the influence of intoxicants, narcotics, or other dangerous drugs to ride, drive, load, or unload a vehicle, containing blasting agents.
 - (c) Transporting or carrying blasting agents on any public vehicle that has paying customers.

WATER-GEL AND EMULSION EXPLOSIVES AND BLASTING AGENTS

GENERAL

Note: Water-gels and emulsions must be transported, stored, and used in the same way as explosives or blasting agents according to product classification unless stated otherwise in WAC 296-52-67150, Water-gel and emulsion explosives and blasting agents, through WAC 296-52-67170, Bulk delivery/mixing vehicles.

WAC 296-52-67160 Types and classifications.

- (1) **Contains explosive substance.** Water-gel and emulsion explosive materials that contain a substance classified as an explosive must be classified as an explosive.
- (2) **Contains no explosive substance.** Water-gel and emulsion explosive materials that do not contain any substance classified as an explosive or as cap-sensitive (as defined under “blasting agent” in WAC 296-52-60130, Definitions) must be classified as an explosive.

Note: Water-gel formulas, which are tested and classified as a U.S. DOT Division 1.2 or 1.3 explosives do not require bullet resistant magazines.

- (3) **Contains blasting agent substance.** Water-gel and emulsion explosive materials that do not contain any substance classified as an explosive and are not cap-sensitive (as defined under “blasting agent” in WAC 296-52-60130, Definitions) must be classified as blasting agents .

WAC 296-52-67165 Fixed location mixing.

- (1) **Buildings.**
 - (a) **Locations.**
 - (i) **Separation distance tables.** Buildings or other facilities used for manufacturing emulsions and water-gels must meet the separation distance requirements of Table H-21 for:
 - (A) Inhabited buildings
 - (B) Passenger railroads
 - (C) Public highways
 - (ii) **Determining distance.** When determining the distances separating highways, railroads, and inhabited buildings from potential explosions (Table H-20), the sum of all masses that may propagate (i.e., lie at distances less than specified in Table H-22) from either individual or combined donor masses are included in the sum. However, when ammonium nitrate must be included, only fifty percent of its weight must be used because of its reduced blast effects.
 - (b) **Construction.** Buildings used for the manufacture of water-gels or emulsions must:
 - (i) Be constructed of noncombustible material or sheet metal on wood studs.
 - (ii) Have mixing plant floors made of nonabsorbent materials, such as concrete.
 - (iii) Be well ventilated.
 - (c) **Heat sources.** Heating units that are designed to be independent of the combustion process within the heating unit, may be used within processing buildings or compartments if they:
 - (i) Have temperature and safety controls

AND

WAC 296-52-67165 (Cont.)

- (ii) Are located away from combustible materials and the finished product.
- (d) **Internal combustion engines.**
 - (i) **Location.** All internal combustion engines used for electric power generation must be:
 - (A) Located outside the mixing plant building
 - OR**
 - (B) Properly ventilated and isolated by a firewall
 - (ii) **Exhaust systems.** Engine exhaust systems must be located to prevent spark emissions from becoming a hazard to any materials, in or near the plant.
- (e) **Fuel oil storage.**
 - (i) **Facilities.** Fuel oil storage facilities must be:
 - (A) Independent structures
 - (B) Located away from the manufacturing building
 - (ii) **Surrounding area.** In order to prevent oil from draining toward a manufacturing building in the event of a tank rupture, the surrounding grounds must slope away from the building.
- (2) **Storage of water-gel and emulsion ingredients.**
 - (a) **Explosive ingredients.** Ingredients must be stored with compatible materials.
 - (b) **Nitrate water solutions.**
 - (i) Nitrate water solutions can be stored in tank cars, tank trucks, or fixed tanks without quantity or distance limitations.
 - (ii) Spills or leaks which may contaminate combustible materials must be cleaned up immediately.
 - (c) **Metal powders.** Metal powders, for example, aluminum, must be:
 - (i) Kept dry
 - AND**
 - (ii) Stored in containers or bins that are moisture resistant or weather tight.
 - (d) **Solid fuels.** Solid fuels must be used in a way that minimizes dust explosion hazards.
 - (e) **Peroxides and chlorates.** Peroxides and chlorates cannot be used.

WAC 296-52-67165 (Cont.)

- (3) **Mixing equipment.** Mixing equipment must comply with these requirements:
- (a) **Design.** The design of processing equipment, including mixers, pumps, valves, conveying, and other related equipment, must:
 - (i) Be compatible with the relative sensitivity of other materials being handled.
 - (ii) Minimize the possibility of frictional heating, compaction, overloading, and confinement.
 - (iii) Prevent the introduction of foreign objects or materials.
 - (iv) Be designed to permit regular and periodic flushing, cleaning, dismantling, and inspection.
 - (b) **Handling procedures.** Equipment handling procedures must be designed to prevent the introduction of foreign objects or materials.
 - (c) **Housekeeping.**
 - (i) A cleaning and collection system for dangerous residues must be provided.
 - (ii) The mixing, loading, and ingredient transfer areas, where residues or spilled materials may accumulate, must be cleaned periodically.
 - (d) **Electrical equipment.** Electrical equipment must:
 - (i) Comply with the requirements of WAC 296-800-280, Basic electrical rules, including wiring, switches, controls, motors, and lights.
 - (ii) Have appropriate overload protection devices for all electric motors and generators.
 - (iii) Be electrically bonded with electrical generators, motors, proportioning devices, and all other electrical enclosures.
 - (iv) Have grounding conductors effectively bonded to:
 - (A) The service entrance ground connection
 - OR**
 - (B) All equipment ground connections in a manner to provide a continuous path to ground
- (4) **Mixing facility fire prevention.** Mixing facilities must comply with these fire prevention requirements:
- (a) All direct sources of heat must only come from units located outside of the mixing building.
 - (b) A daily visual inspection must be made of the mixing, conveying, and electrical equipment to make sure they are in good operating condition.
 - (c) A systematic maintenance program must be conducted on a regular schedule.

WAC 296-52-67170 Bulk delivery/mixing vehicles.

- (1) **Vehicle design.** The design of bulk delivery/mixing vehicles must comply with these requirements:
 - (a) **Public highways.** Vehicles used for the bulk transportation of emulsion, water-gels, or ingredients classified as dangerous commodities on public highways, must meet:
 - (i) U.S. DOT regulations, including placard requirements
 - AND
 - (ii) WAC 296-52-680, Transportation of explosive materials.
 - (b) **Power supply.** When electric power is supplied by a self-contained motor generator located on the vehicle, the generator must be separate from where the water-gel is discharged.
 - (c) **Parking brakes and chocks.** The following are requirements for parking brakes and chocks:
 - (i) A positive action parking brake, which will engage the wheel brakes on at least one axle, must be:
 - (A) Provided on vehicles equipped with air brakes
 - (B) Used during bulk delivery operations
 - (ii) Wheel chocks must supplement parking brakes whenever conditions require.
- (2) **Vehicle operation.** Operation of bulk delivery and mixing vehicles must comply with these requirements:
 - (a) **Driver training.** The vehicle driver must be:
 - (i) Trained in the safe operation of the vehicle and mixing, conveying, and related equipment.
 - (ii) Familiar with the supplies being delivered and emergency procedures.

Pneumatic loading.

- (b) **Cargo and containers.**
 - (i) Hauling either detonators or other explosives is permitted on bulk trucks provided a special wood or nonferrous lined container is installed for explosives.
 - (ii) Detonators and explosives must be in U.S. DOT specified shipping containers, according to 49 CFR Chapter 1.
- (c) **Moving a vehicle in the blast area.** When moving a vehicle in the blasting area:
 - (i) The driver must exercise caution to avoid driving the vehicle onto or dragging hoses over firing lines, cap wires, or explosive materials.
 - AND
 - (ii) A second person must help guide the vehicle driver's movements.
- (d) **Transfer locations.** The location chosen to transfer water-gel or other ingredients from a support vehicle to the drill hole loading vehicle, must be removed from the blast hole site if the drill holes are loaded or are in the process of being loaded.
- (e) **Prohibited activities.** The following are prohibited:
 - (i) In-transit mixing of materials.
 - (ii) Smoking.

WAC 296-52-67170 (Cont.)

AND

Carrying flame-producing devices including matches and firearms near bulk vehicles in the process of mixing, transferring, or down-the-hole loading of water-gels, at or near the blast site.

UNDERWATER BLASTING OPERATIONS

WAC 296-52-67180 Separation distance from vessels and people.

- (1) A blast cannot be fired while any moving vessel is within one thousand five hundred feet of the blasting area.
- (2) People on board vessels or crafts moored or anchored within one thousand five hundred feet must be notified before a blast is fired.

WAC 296-52-67185 Swimming and diving activities.

- (1) A blast cannot be fired while any swimmers or divers are in the vicinity of the blasting area.
- (2) If swimming and diving activities are in progress, a signaling arrangement must be agreed upon to communicate blast warnings prior to blasting.

WAC 296-52-67190 Initiation systems. Water resistant initiation systems must be used for underwater blasting.

WAC 296-52-67195 Loading tubes and casings.

- (1) When a tube is necessary, loading must be done through a nonsparking loading tube.
- (2) Loading tubes and casings must be the same type of metal to prevent electric transient currents from occurring as a result of a galvanic reaction of the metals and water.

WAC 296-52-67200 Multiple charges.

- (1) When more than one charge is placed underwater, a float device must be attached to an element of each charge to make sure it will be released when the charge is fired.
- (2) Blasting flags must be displayed.
- (3) Misfires must be handled according to the requirements of WAC 296-52-67110(3), Misfires.

UNDERGROUND BLASTING OPERATIONS

WAC 296-52-67210 Storage.

- (1) **Permanent storage.** The following are requirements for permanent storage:
 - (a) Explosives or blasting agents cannot be permanently stored in an underground operation until at least two exit routes are developed.
 - (b) Permanent underground storage magazines:

WAC 296-52-67210 (Cont.)

- (i) Must be a minimum of three hundred feet from any shaft, adit, or active underground working area.
 - (ii) Containing detonators must be a minimum of fifty feet away from any magazine containing other explosives or blasting agents.
- (2) **Tunnels, shafts, or caissons.** Detonators and explosives cannot be stored or kept in tunnels, shafts, or caissons.

WAC 296-52-67215 Separation distance: Electrical storms. When an electrical storm is approaching, explosives at the adit, or the top of any shaft leading to where people are working, must be moved to a distance equal to the distance required for inhabited buildings (Table H-20), unless this would create a greater hazard.

WAC 296-52-67220 Proper fume class use.

- (1) **Fume Class 1.** Fume Class 1 explosives must be used for underground operations, as specified by the IME.
- (2) **Fume Classes 2 and 3.** Explosives complying with the requirements of fume Class 2 and 3 may be used if adequate ventilation is provided.

WAC 296-52-67225 Combustible gases or dusts. Explosives cannot be loaded or used underground where combustible gases or combustible dusts exist unless approved by the Mine Safety and Health Administration (MSHA).

WAC 296-52-67230 Initiating systems.

- (1) **Electric systems.**
 - (a) **Safety switch.** A safety switch must be:
 - (i) Placed at intervals in the permanent firing line when firing from a power circuit.
 - (ii) Made:
 - (A) So it can only be locked in the “off position”
 - OR**
 - (B) With a short-circuiting arrangement of the firing lines to the detonator circuit
 - (b) **Lighting gap.** A lighting gap must be:
 - (i) At least five feet ahead (in the firing system) of the main firing switch, between the switch and power source.
 - (ii) Bridged by a flexible jumper cord just before firing the blast.

WAC 296-52-67235 Firing the blast.

- (1) **Employee evacuation.** The blaster must make sure all employees are out of the blast area before firing a blast.
- (2) **Guarding entrances.** All entrances:
 - (a) Leading into the blasting area must be carefully guarded.
 - (b) To any working place where a drift, raise, or other opening is about to hole through must be carefully guarded.
- (3) **Warning signals.** A warning must be given before firing an underground blast. See Table T-1 for signaling requirements .

TABLE T-1	
WARNING SIGNAL	A 1 minute series of long blasts 5 minutes prior to blast signal.
BLAST SIGNAL	A series of short blasts 1 minute prior to the shot.
ALL CLEAR SIGNAL	A prolonged blast following the inspection of the blast.

WAC 296-52-67240 Returning to the blast.

- (1) **Smoke and fumes.** The blaster in charge must wait a minimum of fifteen minutes to allow smoke and fumes to clear before returning to the shot.
- (2) **Muck pile.** Workers cannot return to work until the muck pile has been watered down.

WAC 296-52-67245 High speed tunneling: Central primer house.

Note: The following requirements apply when primers are made up at a central primer house for use in high speed tunneling:

- (1) **Primers.**
 - (a) Only enough primer must be made for each round of blasting.
 - (b) Primers must be placed in separate containers and bins, categorized by the degree of delay in preventing physical impact.
- (2) **Separation of explosives in magazines.** Explosives transported in the same magazine must be separated by:
 - (a) One-quarter inch steel

AND
 - (b) Covered on each side by four inches of hardwood planking or equivalent protection.